FAA
general aviation NEWS
MARCH—APRIL 1982

A **DOT** / FAA FLIGHT OPERATIONS SAFETY PUBLICATION

In This Issue:

FAIR-WEATHER FIENDS, P. 3

Also:

• Challenging the Sun, P. 6
• The Good Old Days, P. 8
• Maximum Loads vs Minimum Strips, P. 11

FAA GENERAL AVIATION NEWS

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

MARCH-APRIL 1982
Volume 21, Number 2

Drew Lewis, *Secretary of Transportation*
J. Lynn Helms, *Administrator, FAA*
Walter Luffsey, *Assoc. Admin., Aviation Standards*
Kenneth S. Hunt, *Director, Flight Operations*
Bernard A. Geier, *Chief, General Aviation and Commercial Division*
David Gelfan, *Editor*
P. A. Duncan, *Assoc. Editor*, Louise Oertly, *Ass't Editor*

FAA GENERAL AVIATION NEWS is published by Flight Operations, AFO-807, Federal Aviation Administration, Department of Transportation, Washington, D.C. 20591, in the interest of flight safety. The magazine is designed to promote safety in the air by calling the attention of general aviation airmen to current technical, regulatory and procedural matters affecting the safe operation of aircraft. Use of funds for printing FAA GENERAL AVIATION NEWS was approved by the Office of Management and Budget through August 31, 1983. All printed materials contained herein are advisory or informational in nature and should not be construed as having regulatory effect. The FAA does not officially endorse any goods, services, materials or products of manufacturers that may be mentioned. **Certain details of accidents described herein are altered to protect the privacy of those involved.**

SUBSCRIPTION SERVICES

FAA GENERAL AVIATION NEWS is sold on subscription at $9.00 per year (individual copies $2.00 Domestic, $2.50 Foreign) by the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Use the self-mailer order form in the centerfold of this magazine to subscribe. Prices are subject to change without prior notice.

Please anticipate one to two months for processing orders. Subscriptions are for one year only, and only one renewal notice is sent. Act promptly to avoid lapse of subscription.

Subscription problems. Contact the Service Section, SSOS, GPO, Washington, D.C. 20402.

Change of subscriber's address. Send old label and new address to MAIL LIST SECTION, GPO, Washington, D.C. 20402.

BRIEFS

LOOK OUT BELOW. Springtime weather provides prime flying conditions for two kinds of operators that could end up in potential conflict with each other. Both aerial applicators and ultralight "flyers" operate relatively low to the ground, in sparsely trafficked areas and rely on clear skies and calm winds in the early morning and evening for safest operation. To prevent conflicts, aerial applicators are encouraged to display strobes, anti-collision lights, landing lights, rotating beacons, etc., while conducting spraying operations in daylight in order to be more conspicuous, especially in areas where the landscape tends to camouflage aircraft. Ultralight operators are advised to look out below, as well as everywhere else.

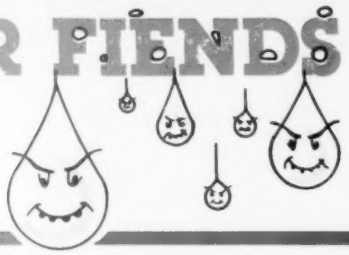
KNOXVILLE TRAFFIC. Pilots planning on flying in for the 1982 World's Fair in Knoxville, TN this May 1 through October 31 should make note of procedure changes for the Knoxville TRSA. In order to accommodate increased traffic, other than published approach control frequencies may be used. VFR pilots headed for either Knoxville Downtown or McGhee Tyson Airports should monitor the Knoxville ATIS on 128.35 to learn the proper frequency for initial call-up. If other than the published frequency is in use, call up at least 20 miles out over one of the established VFR checkpoints. Consult Notices to Airmen for updating.

NOT "FAIRING" WELL. Aircraft operating from unpaved fields may pick up a little something extra after the seasonal thaw. Recently during a brake inspection the wheel speed fairings were removed from a PA-28 that used a sod runway. Each fairing had nearly 23 pounds of dirt caked inside—potential interference with wheel rotation and braking. For soft field operations, temporary removal of the fairings should be considered. Some installations must be done by a certificated mechanic. Weight and balance will be affected, also airspeed.

CRITTERS ALOFT. Aircraft, including balloons, that have been in storage for the winter may hold some unexpected surprises unless they are inspected thoroughly before spring's first flight. Unwelcome "passengers" have included nesting snakes, scorpions, spiders, bees, rats, and other assorted and unpleasant varmints. The likelihood of these interlopers becoming agitated—and dangerous—in flight is something no pilot wants to face. Seek them out before you depart.

THE FAIR-WEATHER FIENDS

How to keep your engine from being strangled



Induction icing, or "carburetor ice" is one of those problems which continue to plague general aviation flying despite the fact that preventive equipment is standard on virtually all production aircraft and the manufacturers' instructions are fairly explicit. About 60 accidents per year, many of them serious or fatal, are attributed by the National Transportation Safety Board to induction icing, which the Board regards as an "unnecessary" casual factor, due largely to pilot inattention or to lack of familiarity with the phenomenon.

Many pilots find it hard to believe that when you are flying along in beautifully clear weather, with the ground temperature pushing 90°F , it is possible for the temperature in the carburetor to fall below freezing—but that is a fact. The Safety Board tested two typical light planes, one with a float-type carburetor and the other with a pressure-type. With the first plane, serious icing occurred with outside air temperatures as high as 93°F and with the relative humidity as low as 30%, at glide power; at cruise power the maximum ambient temperature at which icing occurred was 63°F and the minimum humidity was 60%. With a pressure type of carburetor, serious icing took place with air temperature up to about 70°F and humidity over 32%, at glide power. At cruise the maximum temperature for icing was 55°F, with the humidity 90% to 100%. When you consider that at cruise the ambient temperature is much lower than the surface temperature, you have to realize that induction icing is possible at almost any time and place.

What causes the sharp heat loss in the carburetor? In any type of piston engine, the air drawn into the engine air intake system expands as it passes through the venturi and over the throttle valve, lowering the temperature—normally not more than 5°F. When the ambient temperature is above 37°F, the pilot need not be concerned with icing in an induction system where only air passes the throttle, as is the case with fuel injected engines and certain other systems.

The major loss of heat is brought about by the *vaporization of fuel.* When vaporization of fuel takes place in the vicinity of the throttle valve, as with most carburetor-type engines, the temperature loss may exceed 60°F. It is the cumulative effect of both air expansion and fuel vaporization that leads to ice forming on the throttle valve and in the adjacent passages of the carburetor.

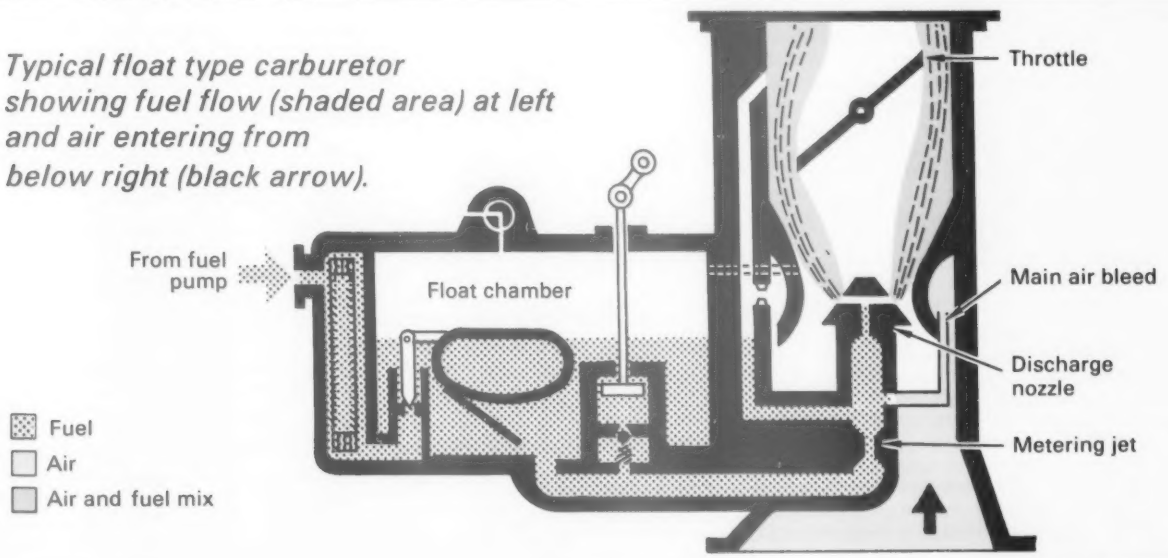
Reduced power settings are most conducive to throttle area icing, not only because engine temperatures are lower but also because the partically closed valve more easily allows icing to completely block the passageway and shut down the engine—unless carburetor heat is applied promptly.

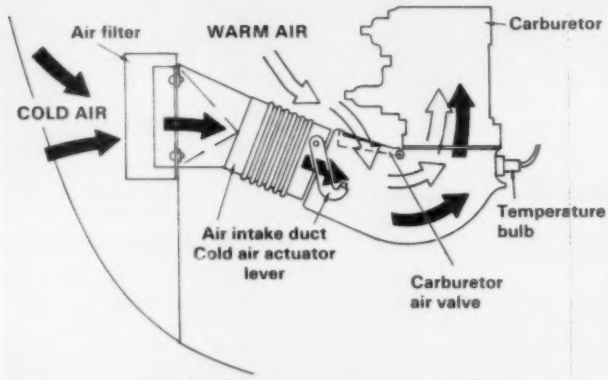
Icing may also form downstream from the throttle, as a result of "entrained" water (water in solution in the fuel). The sharp drop in temperature in the carburetor from fuel vaporization may precipitate any moisture entrained in the fuel. Continued vaporization may freeze the condensation onto the induction piping, especially in the "elbows" formed by bends. If no anti-icing action is taken, ice may build up in an elbow until it chokes off the passage of the fuel-air mixture to the engine.

Carburetor air *heating* is accomplished by passing intake air through a heat exchanger before it reaches the carburetor, where it melts the ice obstruction. Engines with fuel injection have available an alternate air supply derived through a port located downstream from the air scoop screen. If the screen becomes blocked with impact ice, the drop in pressure causes the port to open. The inlet port for alternate air is located within the engine cowling so that this air is warmed somewhat by engine heat, even though it does not pass through a heat exchanger.

→

Typical float type carburetor showing fuel flow (shaded area) at left and air entering from below right (black arrow).





Typical (non-supercharged) Carburetor Induction System

In contrast to throttle ice, which may occur in clear weather and at warm temperatures, **impact ice** forms only when visible snow, sleet, freezing rain or supercooled moisture is present, at temperatures of 32°F or lower. Impact ice is ice which freezes in the air scoop or in any section of the primary air intake passages, including screens and air valves.

The ambient temperature at which impact ice may be expected to build up most rapidly is about 25°F. When ice is observed forming on the windshield or leading edge of the wings in flight, pilots should anticipate the danger of impact ice and consider using carburetor heating or alternate air, before the port for bringing in alternate air becomes frozen shut, as it may in severe icing conditions.

Although many pilots associate carburetor icing mainly with approach and landing, the possibility exists in all phases of flight, beginning when the aircraft is still on the ground. Prolonged engine idling prior to takeoff can lead to carburetor ice even in conditions of fairly low humidity. On March 30, for example, a recently certificated pilot took off in a single-engine, carburetor-type aircraft from Palm Springs, near the Mojave Desert in California, after a 20 minute delay on the ground with the engine idling. During climbout the pilot experienced power loss, and complete engine stoppage occurred at an altitude of 3,000'. After unsuccessfully attempting to restart the engine the pilot was unable to return to the airport. He made a safe emergency landing in an area of shallow sand dunes, substantially damaging the aircraft.

Investigators found no mechanical reason for the engine stoppage and the engine was found to run satisfactorily after the crash. There was no sediment or water found in the fuel. The pilot stated that his pre-flight magneto check was normal. The National Transportation Safety Board determined that carburetor icing had formed during the long idling period after the run-up, and that the pilot had failed to use carburetor heat prior to takeoff, in accordance with proper operating procedures. At the time of the accident the temperature on the ground was 80°F , and the dewpoint 38°. Many pilots might assume that with such low humidity and with the engine heat accumulated during ground idling, icing would be out of the question. Apparently the nearly closed throttle setting was an overriding factor.

At cruise power settings, normally icing will not occur when the spread between the temperature and the dewpoint is that broad. The more that the temperature and dewpoint readings converge toward each other, of course, the greater the humidity, and the greater the danger of icing. A 20-point spread indicates relative humidity of about 50 percent, a condition which may lead to carburetor icing. Disregarding the spread and the need for precautionary application of heat can lead to engine stoppage with little warning. In most cases the onset of icing will be indicated by a rough running engine or loss of rpm at a constant throttle setting, but occasionally the engine stoppage will be fairly abrupt. Once the engine has stopped the available heat (from the exhaust manifold) for warming incoming air is dissipated quickly, and may be insufficient to clear the ice-blocked passageways.

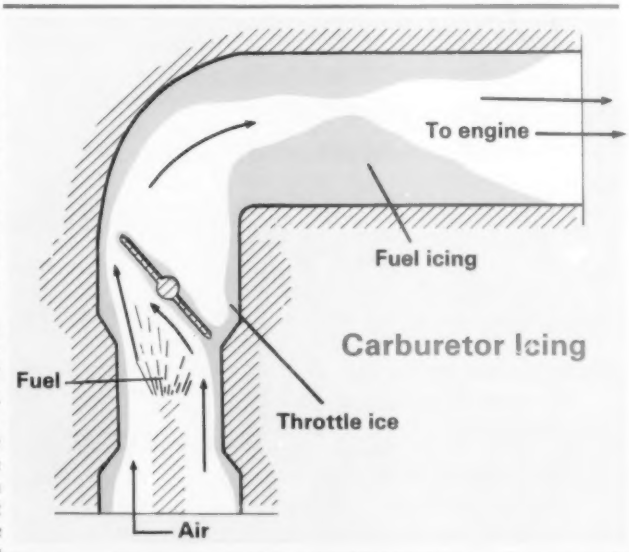
This was the experience of a young pilot in Texas, while on a flight from Dallas Airpark to Winnsboro, LA in a Cessna 150, on personal business. He had filed a VFR flight plan with a cruise altitude of 7,500', and departed at 5:00 a.m. His weather briefing indicated temperature 39°F and dewpoint 31°. After an hour at cruise the engine began to knock and the 150 lost altitude. In his statement later to investigators the pilot said that he applied carburetor heat at this time but the airplane continued to lose power. After declaring an emergency and squawking 7700 on his transponder he attempted to land on a plowed field nearby, but impacted a tree during his approach and struck the ground in an inverted position. The plane fortunately did not burn and the pilot, who was not seriously injured, managed to extricate himself from the wreckage and summon aid.

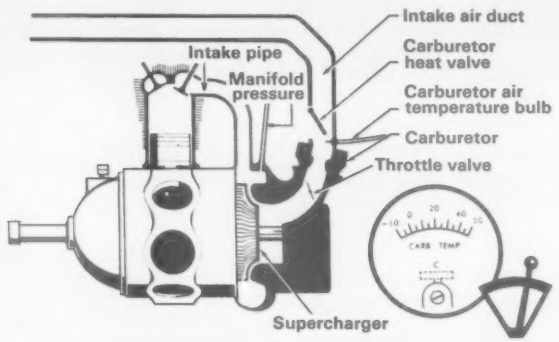
Significantly the carburetor heat control was found in the "cold" or "off" position, indicating that either the pilot was mistaken about having applied heated air or that he closed the control prematurely. When carburetor heat is first applied to an engine that is running rough, some temporary further degradation of performance may be expected, since warmed (less dense) air increases the ratio of fuel to air in the mixture. However, unless a carburetor heat gauge has been installed, temporary or partial application of heat may do more harm than good, by inadvertently producing carburetor temperatures most conducive to icing. (Throttle or fuel icing rarely forms when the ambient temperature is below freezing.)

The exact recommendations for use of carburetor heat vary in detail from one manufacturer to another, and in some cases from one model and year to another.

For example, Cessna's manual for their 1981 model 152 advises that when ice is suspected in cruise, *"Apply full throttle and pull the carburetor heat knob full out until the engine runs smoothly; then remove carburetor heat and readjust the throttle. If conditions require the continued use of carburetor heat in cruise flight, use the minimum amount necessary to prevent ice from forming and lean the mixture for maximum rpm or recommended lean mixture as desired."* The use of full carburetor heat is also recommended during flight in very heavy rain, to avoid the possibility of engine stoppage due to excessive water ingestion. Full heat is recommended before reducing power for descent and landing. After landing, pilots are advised to turn off carburetor heat (to avoid unfiltered ground debris entering the induction system).

Piper advises, in their *Cherokee* 180 manual, that *"Unless icing conditions in the carburetor are severe, do not cruise with the heat on. Apply full carburetor heat slowly and only for a few seconds at intervals*





Induction System with Supercharger

determined by icing severity." Similarly, Piper advises that during approach and landing, "*Carburetor heat should not be applied unless there is an indication of carburetor icing since the use of carburetor heat causes a reduction in power which may be critical in a go-around. Full throttle operation with heat on is likely to cause detonation.*"

The Mooney *Master* manual advises simply, "*Should a carburetor ice be suspected (during cruise), use full carburetor heat to clear carburetor.*" For let-down and landing, full carburetor heat is recommended.

Pilots of aircraft for which specific manufacturer instructions do exist are advised to adhere to them. Where such recommendations are not available, consult FAA's latest Advisory Circular on induction icing (AC 20-113, October 22, 1981). It discusses the subject fully and contains the following advisory procedures:

• **Pilot maintenance.** Periodically check the carburetor heat systems and controls for proper condition and operation.

• **Start up.** Start the engine with the carburetor heat control in the COLD position to avoid possible damage to the system and a fire hazard because of a backfire while starting.

• **Mag check.** As a preflight item, check the carburetor heat effectiveness by noting the power drop (when heat is applied) on runup.

• **Ground icing.** When the relative humidity is above 50 percent and the temperature is below 70°F , apply carburetor heat briefly immediately before takeoff, particularly with float type carburetors, to remove any ice which may have been accumulated during taxi and runup. Generally, the use of carburetor heat for taxiing is not recommended because of possible ingestion of foreign matter on some installations which have the unfiltered air admitted with the control in the HOT or ALTERNATE AIR positions.

• **Takeoff.** Conduct takeoff without carburetor heat, unless extreme intake icing conditions are present.

• **Climb out.** Remain alert for indications of induction system icing during takeoff and climb-out, especially when the relative humidity is above 50 percent, or when visible moisture is present in the atmosphere.

• **Temperature gauges.** With instrumentation such as carburetor or mixture temperature gauges, partial heat should be used to keep the intake temperature in a safe range. Without such instrumentation, full heat should be used intermittently as considered necessary.

• **Applying heat.** If induction system ice is suspected of causing a power loss, apply full heat or alternate air. Do not disturb the throttle until improvement is noted. Expect a further power loss momentarily and then a rise in power as the ice is melted.

• **Climb power.** If the ice persists after a period with full heat, gradually advance the throttle to full power and climb at the maximum rate available to produce as much heat as possible. Leaning with the mixture control will generally increase the heat but should be used with caution as it may kill the engine under circumstances in which a restart is impossible.

• **Clouds.** Avoid clouds as much as possible, when experiencing or suspecting induction icing.

• **Backfiring.** As a last resort, and at the risk of catastropic engine damage, a severely iced engine may sometimes be relieved by inducing backfiring with the mixture control. This is a critical procedure at best, should not be attempted with supercharged engines, and must be done with the carburetor heat control in the COLD position.

• **Descent.** Heat should be applied for a short time to warm the induction system before beginning a prolonged descent when the engine is to be throttled back on the descent. Power lever advancement should be performed periodically during descent to assure that power recovery can be achieved. The pilot should be prepared to turn heat off after power is regained to resume level flight or initiate a go-around from an abandoned approach.

• **Temperature/humidity.** The pilot should remember that induction system icing is possible particularly with float type carburetors, with temperatures as high as 100°F and the humidity as low as 50 percent. It is more likely, however, with temperatures below 70°F and the relative humidity above 80 percent. The likelihood of icing *increases* as the temperature *decreases* (down to 32°F) and as the relative humidity *increases*.

• **General.** When no carburetor air or mixture temperature instrumentation is available, the general practice with smaller engines should be to use *full* heat whenever carburetor heat is applied. With higher output engines, however, especially those with superchargers, discrimination in the use of heat should be exercised because of the possible engine overheating and detonation hazard involved.

In the case of pressurized aircraft, use of alternate or heated carburetor air may require depressurization of the passenger compartment. In any airplane, the excessive use of heat during full power operations, such as takeoffs or emergency go-arounds, may result in serious reduction in the power developed, as well as the hazard of engine damage. It should be noted that carburetor heat is rarely needed for brief high power operations.

An unexplained RPM drop should raise suspicions of induction icing in fair weather or foul. Internal icing may give little or no warning.

• **Fuel System icing.** The use of anti-icing additives for some piston-engine powered aircraft has been approved as a means of preventing problems with water and ice in aviation gasoline. Some laboratory and flight testing indicating that the use of hexylene glycol, certain methanol derivatives, and ethylene glycol monomethyl ether (EGME), in small concentration, inhibit fuel system icing.

CAUTION: It should be recognized that the anti-icing addition is in no way a substitute or replacement for carburetor heat. Strict adherence to operating instructions involving the use of carburetor heat should be adhered to at all times when operating under atmospheric conditions conducive to icing.

The bedeviling nature of all forms of induction ice is that it is rarely seen by human eyes (except when experimentally produced in the laboratory). If a forced landing or crash occurs following engine failure from suspected carburetor ice, by the time investigators arrive on the scene no "hard" evidence remains. Installing a carburetor heat gauge is the only sure way of keeping the ice gremlins out of the carburetor during flight. They are almost always hanging around somewhere. ■

Paul MacCready

Challenging the Sun

Powering an aircraft from the source of all energy

The rays of the sun, which loosened the wings of the first legendary pilot of ancient Greece, Icarus, and caused his down fall, were used last summer to power an aircraft 165 miles from Paris to London—and to prove a point. The designer of the first aircraft to be powered directly by the sun, the *Solar Challenger*, was Dr. Paul MacCready, already famous for having produced the first officially successful human-powered airplane, the *Gossamer Condor*. These remarkable achievements go hand in hand with MacCready's lifelong dream of freeing modern man from his dependence on fossil fuels for energy.

Ironically, MacCready's *Challenger*, like the *Condor*, was designed not to point the way to a new means of transportation but to bury an old myth: that human progress requires man to plunder the earth.

From model aircraft building as a youth, Connecticut-born Paul MacCready grew up to become a WWII naval aviator, an international glider champion, and an engineer with a Ph.D. in aeronautics.

He was operating his own company, Aero-Vironment, Inc., in 1970 when the International pursuit of the Kremer Prize of $100,000 for a human-powered flight over a prescribed course caught his attention. The prize money and the practical applications of human-powered aviation did not interest him as much as the opportunity to prove his contention to a world-wide audience that there were no unmovable obstacles to human desire.

By concentrating on lightness and strength of structure and disregarding all practical applications, MacCready was able to succeed where many had failed. He not only won the Kremer Prize in 1977 but sent a succeeding human-powered aircraft, the *Gossamer Albatross*, across the English Channel in 1979.

Having mastered the art of minimum airframe weight (the *Albatross* weighed only 55 lbs. empty), MacCready was now ready to harness a power source that was unlimited: the sun. He had always had a keen interest in the safekeeping of the environment and was increasingly concerned with "our absurd reliance" on fossil fuels. One alternative to their rapidly dwindling supply and the mounting danger of air pollution was solar power. Popular interest in this form of energy was difficult to excite, as long as petroleum was available, no matter what the price per barrel. Solar-powered buildings were making but slow progress. What MacCready needed was something bold and spectacular to prove his point.

How about a solar-powered airplane?

He was aware that in 1979 one inventor had flown an airplane powered by a storage battery charged with electricity produced by means of photovoltaic cells. That was not good enough for MacCready. To demonstrate what solar power was capable of, MacCready wanted to design an airplane that would takeoff, climb, fly, and land on *direct* solar power. The battery weight had to be eliminated.

So MacCready took the *Gossamer Penguin* (a back-up ship for the *Albatross*), re-designed it slightly, put a small motor behind a nine-foot constant speed propeller, attached an ungainly panel with 16,000 photovoltaic cells borrowed from NASA atop its wings, and began testing.

A photovoltaic, or solar, cell is a thin silicon wafer with layers of varying materials sensitive to visible light. As visible light passes through the wafers, photons—light "particles"—interact with the chemicals in the layers and are stripped of electrons. These captured electrons are channeled along conducting wires attached to the wafers, forming a current of electricity. On the modified *Penguin*, the current was directed to an electric motor capable of turning at 7,500 rpm—much too powerful for the lightweight craft. Using a bicycle sprocket and chain he found laying around the shop, he geared the prop down to 300 rpm, quite sufficient for his purposes.

After static run-ups, MacCready felt he was ready for a pilot. Because the solar cells added so much weight to the once 55-lb. craft, a small but capable pilot was required. MacCready's first choice was his 13-year old son Marshall, who performed the initial test hops over the Arizona desert. Later a diminutive 95-pound pilot-housewife named Janice Brown took over.

On the first early flights, altitudes of scarcely more than 100 feet were flown, not high enough for optimal sun power but enough to convince MacCready the idea would work.

The next problem was money. In DuPont Chemical, MacCready found a patron who was interested in publicizing its ultra-lightweight, space-age materials. DuPont offered time, money, engineers, and a film crew, not to mention Kevlar, Mylar, Delrin, Lucite, Teflon, and Dacron for the airplane structure.

MacCready started with the basic *Gossamer* design—a carbon-tube skeleton with thin but strong Mylar skin. The result looked like a child's rubber-band driven oversized model, but in reality it was a miracle of modern technology. Without its solar cells, the *Solar Challenger* weighed barely 125 lbs. (217 lbs. with cells). To assure that the solar cells received optimum radiation, the 47-foot wings and 13-foot stabilizer were tilted 15° to the rear. To provide extra space for the cells, the stabilizer was separated from the rudder and suspended on a fuselage boom, between the pilot's seat and vertical stabilizer. With the prop

and the tiny motor's pylon jutting out in front, the *Challenger*'s length was just over 30 feet.

By Spring of 1981, MacCready's newest flight of the imagination was ready, and DuPont began making arrangements to ship the airplane to Europe. MacCready was making his own arrangements—foremost of which was selecting a new pilot. The honor fell to 28-year old Steve Ptacek, proficient in everything flyable from gliders to jets. Ptacek slimmed from 155 lbs. to 130 for the flight and trained for physical endurance rather than strength. Top speed on the *Challenger* was hardly more than 30 mph, which meant a flight of four to six hours from France to England.

In June of 1981, the *Challenger* was shipped to France on board an air carrier, followed hurriedly by MacCready, Ptacek, and their DuPont retinue. Mother Nature then blessed France in June with the worst weather in memory. Ptacek spent a frustrating month gazing up at grey clouds and wondering whether he would ever get to fly while MacCready shuttled between England and France, assuring his sponsors and coordinating the flight with French and English air traffic services.

The initial plan was to fly from Orly Airport near Paris to London/Heathrow. However, the uncertainty of their departure date (they were dependent on light, following winds) created so many problems with arrangements for fitting into the flow of London-bound European air traffic that plans were changed. MacCready decided that if the weather ever permitted, Ptacek would depart from a small airport 25 miles north of Paris, and if he landed anywhere on English soil, the trip would be a success.

Contrary northerly winds were so persistent that MacCready considered reversing the direction of flight, although the northwesterly course offered the best angle to the sun's rays. But finally the winds shifted, and on July 7, 1981 shortly after 9 a.m., Ptacek began taxiing the *Challenger* down the runway at the village of Cormeilles-en-Vexin. At first it seemed like this beautifully clear day would not witness the great event either. After seven attempts, Ptacek was able to become airborne only once and that for just a few feet. But on his eighth try the *Challenger* lifted off smartly and began to climb at a modest 200 fpm. In a few minutes, Ptacek was at 2,000′ and headed for the English Channel.

Climbing steadily Ptacek was busy making course adjustments and tuning the controllable prop for best performance when he encountered something the he had not expected in the prevailingly calm air—turbulence which threatened to wrench the fragile aircraft out of control. Ptacek looked around and found the source of his problems. A French airplane and a helicopter laden with curious newsmen and photographers were flying around him, not so close as to create a collision danger but close enough that their wakes were highly disruptive.

The *Challenger* was pitching and twisting so violently that Ptacek, perched in his plastic bubble at 11,000′ altitude, felt that at any moment he might be flung into the sea, like Icarus of old. French air traffic control came to the rescue in the nick of time. After establishing contact with the news media pilots, controllers threatened enforcement action unless they left the *Challenger* alone. They complied.

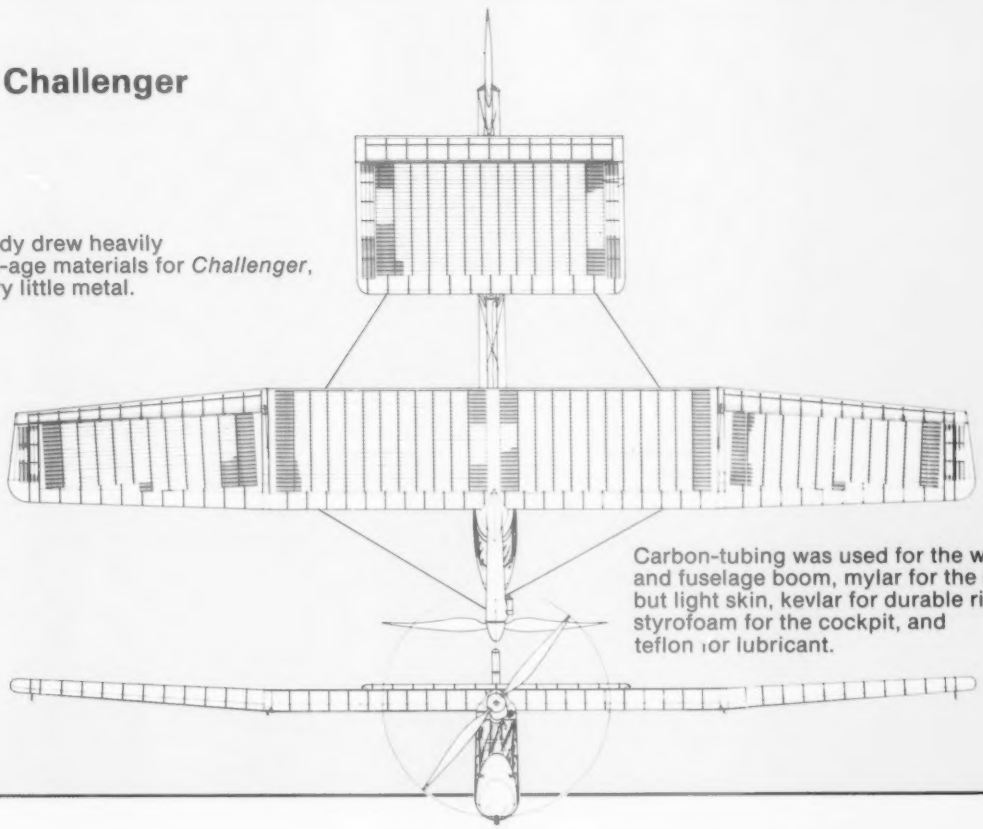
Ptacek was then obliged to chart a zig-zag course to avoid some fair weather cumulus clouds that threatened to block his lifeline to the sun. Soon he left them behind, the chalk cliffs of Dover came in view, and he was over English soil. After five and a half hours, he was ready to land at Manson Royal Air Force Base. Here once again Ptacek needed air traffic control assistance to free his path from the enclave of news planes that swarmed overhead. The runway area was cleared and the *Challenger* landed safely, amid an enormous crowd of well-wishers including an emotionally drained Paul MacCready.

Asked by reporters what use anyone might have for a $700,000 solar-powered aircraft, MacCready smiled and shrugged, "Perhaps none."

Perhaps. And then again, perhaps one day the skies will be filled with ultralights dancing in the light of the sun. ■

Solar Challenger

MacCready drew heavily on space-age materials for *Challenger*, using very little metal.



Carbon-tubing was used for the wing spars and fuselage boom, mylar for the strong but light skin, kevlar for durable rigging, styrofoam for the cockpit, and teflon for lubricant.

THE GOOD

A look at a general avi

Breakfast finished and ready to leave for the airport, the pilot settled down to plan his flight from Washington, DC to St. Paul. Taking a fresh cup of coffee into his den, he sat down before his personal computer terminal. He linked it with the telephone and pressed a button that dialed a pre-programmed number. Instantly the screen lit up with the words:

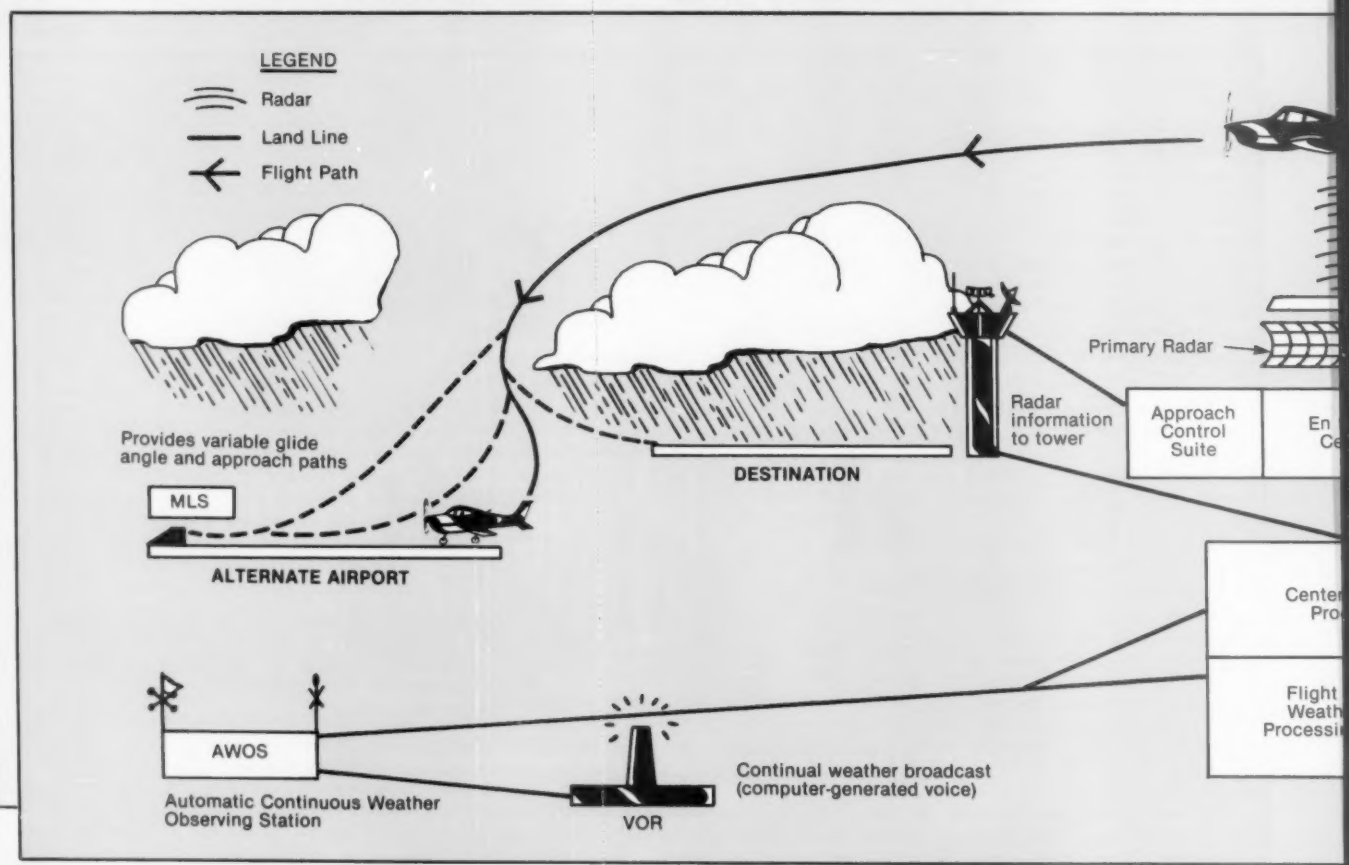
"Good morning, this is the Washington Flight Service Station. If you wish a weather briefing press the 'W' key. If you wish to file a flight plan press the 'F' key. If you wish to speak directly with a specialist at any time press the CLEAR key and pick up the phone. Thank you."

He pressed the "W" key and began following the displayed instructions for obtaining his briefing—keying in his route of flight, desired altitude, and pressing the appropriate keys for reports and forecasts and pertinent NOTAMs and PIREPs, even radar summary charts and satellite photos. He quickly made notes on the reports and forecasts, then pressed another key to engage the printer to give him copies of the charts and pictures.

Next he pressed the "F" key and a facsimile of a flight plan form appeared on the screen. After filling in all the information he pressed ENTER and watched as the screen showed confirmation of his IFR flight plan. With another press of a button the pilot acknowledged and the screen wished him a safe flight. Glancing at his watch he noted just how short a time his weather briefing and route planning had taken—less than five minutes in all. The eye was indeed quicker than the ear.

Before the days of pilot access to weather he had often been torn between a desire for more information and a reluctance to take up too much of the FSS specialists' time, knowing other pilots might be in urgent need of their services. With the wealth of information that was now accessible at the touch of a button there was no reason for haste and no excuse for slipshod planning. He could still talk to an FSS specialist when he needed help in making a decision, but he didn't need to take up anyone else's time to assemble the data. Confidently, he gathered up his notes and charts and left for the airport to meet his passengers.

At the airport he used his fixed base operator's computer terminal to update his weather information and to amend his flight plan to circumvent some developing convective weather along one leg of his route. He preflighted his twin turboprop C-610 and loaded his three passengers and their baggage. Inside the cockpit he began his checklist and switched



OLD DAYS

ion flight in the 1990's

on his radios and Mode S transponder, which linked him, via the airport relay transmitter, to the air traffic system.

After engine start he tuned in clearance delivery and pressed the "Ready to Copy" button on the Mode S transponder console. Within seconds his radar signal had been heard and identified, and the following message appeared on his transponder screen:

"N52PA, C-610, Manassas Clearance Delivery. Cleared as filed to St. Paul. Maintain runway heading. Climb and maintain 4,000. Expect 6,000 10 minutes after departure. Departure frequency 120.45. Squawk 1747."

He hit the acknowledge button after copying and the message disappeared. Another press of a button in the transponder console alerted Ground Control (via landline data link) he had received his clearance and was ready to taxi. The screen responded with:

"N52PA, C-610, Manassas Ground, cleared to runway 16 left via taxiway echo. Follow the *Super Citation*." The pilot looked around. There were two business jets on the ramp with him, both looking as if they were ready to taxi. He was not quite sure which was the *Super Citation*, so he pressed the CLARIFY button. The screen printed out:

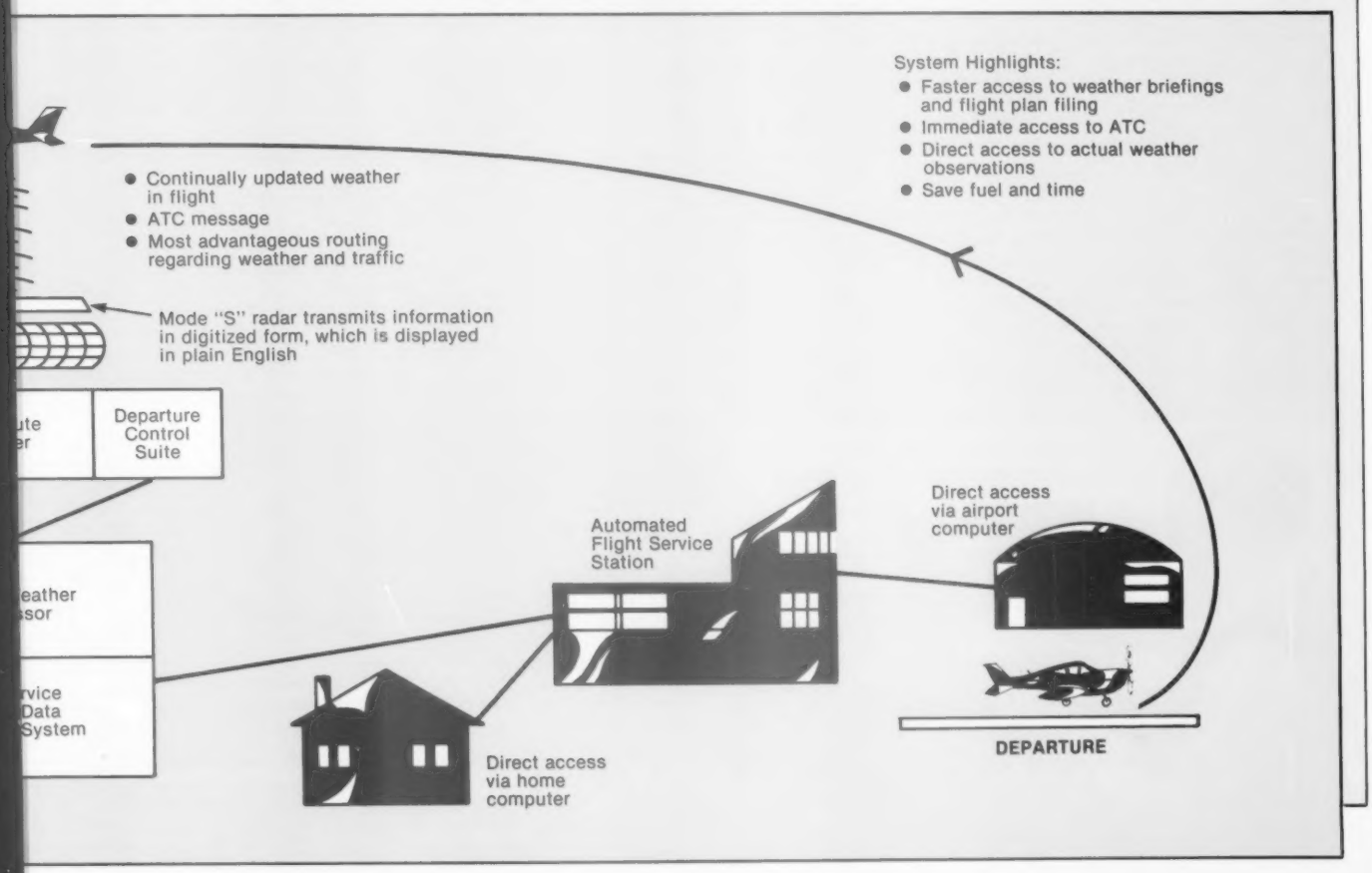
"N7329Q, *Super Citation*, twin-engine business jet. Red, white, and blue." The pilot looked and spotted 29Q beginning to taxi. He pressed ACKNOW and also began to taxi according to his instructions.

As the *Super Citation* began its takeoff roll the C-160 pilot accomplished his run-up, unlimbered the seldom-used microphone and announced to Manassas Tower he was ready to takeoff.

Manassas responded with the first live voice contact from Air Traffic Control:

"52PA, Manassas Tower. Hold short of runway 16 left. A Beech 99 is on final." The pilot acknowledged and watched and waited as the old twin Beech landed and then he heard the tower call and tell him to taxi into position and hold. Once on the runway he was cleared for takeoff. Considering how busy the little suburban airport had become, he felt good about getting his critical clearances—like when to takeoff and land—from a living source, but the machines were great for the routine stuff.

The passenger who was sitting up front with him—an ex-commuter pilot named Henderson who hadn't flown in years—commented on the quick departure as they lifted off and took up their climb heading with very little change of course: "Must not be very busy today." →


System Highlights:
• Faster access to weather briefings and flight plan filing
• Immediate access to ATC
• Direct access to actual weather observations
• Save fuel and time
• Continually updated weather in flight
• ATC message
• Most advantageous routing regarding weather and traffic
Mode "S" radar transmits information in digitized form, which is displayed in plain English
Departure Control Suite
Automated Flight Service Station
Direct access via airport computer
Direct access via home computer
DEPARTURE

The C-160 pilot smiled, knowing that Manassas Tower was handling near peak traffic most of the day. Maybe Henderson didn't know about digitized data that flashed out messages at the speed of light instead of at the much lower speed of sound. Or the expanded capacity of an airport using a microwave landing system (MLS).

The phrase "Contact departure control." appeared on his transponder screen. He pressed the appropriate button on his console, and the handoff was acknowledged on the screen. The screen then displayed further instructions concerning his heading and cruise altitude, which he acknowledged with a touch of a button. After an uneventful climb he leveled off at cruise. His transponder indicated he had been handed off to Washington Center and gave him the radio frequency.

Relaxing, the pilot kept a peaceful watch on his instruments and an eye on the Mode S transponder screen, as routine traffic advisories occasionally appeared, alerting him with a chime and giving him only information pertinent to his flight over the discrete code assigned his aircraft.

"Not that much friendly chatter," the passenger Henderson said. "Not like in the good old days of flying."

The good old days indeed. Yes, gone were the days of distracting radio chatter and stuck mikes and long, meandering transmissions from unhurried pilots. The screen gave you all you needed to know in simple, direct language with no ambiguous or non-standard phraseology.

A check on his DME showed his groundspeed was less than he had planned on, so he decided it was time for a weather check. In the past he'd have had to request permission to leave the frequency, call Flight Watch, and *possibly* get information that might help him en route--that is, *if* they had any PIREPs that weren't too old, and *if* the reports and forecasts had been recently updated, and *if* their radar wasn't down, and *if* they weren't too swamped with requests, and *if*....

He pressed the "WX" button on the transponder. The Center computer received the request, noted his position and altitude, delved into its memory banks for his route of flight, searched out and sent up via the data link only the information he would find useful—in a matter of seconds.

The current weather shown on his transponder screen indicated that winds aloft had increased in intensity and had altered direction to the point where they were an almost direct headwind. That was causing his reduced groundspeed and, of course, increased fuel consumption. The pilot did a quick calculation and determined he would still have sufficient fuel to make his destination and alternate and be within the required reserve. He was about to comment to his passenger up front, but he observed that Henderson had nodded off to sleep.

As he progressed on the flight, drawing to closer to St. Paul, the C-610 pilot decided it was time for a destination weather check. He punched DEST WX on the transponder and waited. The Automatic Weather Observation System (AWOS) at Airlake Industrial Park Airport, the uncontrolled airport he was heading for near St. Paul, indicated that weather minimums for his approach still prevailed, although they were now marginal. The pilot noted the time of the observation—just five minutes old. As he watched, the screen cleared and a new observation came up: Ceiling 100 obscured, visibility ¼-mile in fog and rain. *That tore it. The low pressure system was moving in faster than expected.* Maybe in the *good old days* he would never have known about it until he got there.

He pressed the ALT (alternate) WX button on the console and found the weather for his alternate destination, Lake Elmo Municipal, to be 3,000 overcast, visibility 5 miles, winds calm. Then he pressed ALT CLR for a clearance to divert to his alternate. The screen displayed a new route that would take him north of his destination around the St. Paul TCA. Hoping for a less circuitous route, in view of his fuel reserve, he pressed REJECT. Another route that turned him slightly northeast and put him under the floor of the TCA was displayed. That was much better. He pressed ACKNOW and received clearance to alter his heading and altitude.

After that, routine communications were handled by the transponder display, requiring only the pilot's push-button acknowledgement. Of course, he had the option of contacting the controller directly, but nothing needing clarification came up. Then about 30 miles from Lake Elmo the chime rang three times, alerting him that a special communication was about to be sent. The transponder screen was displaying a just-issued SIGMET calling for severe turbulence north of St. Paul. The alert had been sent selectively by radar to him and to other aircraft bound for that area. The computer then offered him an approach to runway 13 from the southeast that would keep him away from the turbulence.

In the old days he probably would have had to land short to avoid the turbulence or at least refuel before he tried to ride it out. But now with MLS, the new microwave landing system at Lake Elmo he could be funneled onto the runway from any approach fix, while receiving continuous horizontal and vertical guidance. He could also be separated more effectively from heavy jets and their everpresent wake turbulence.

He felt a tap on his shoulder and turned to see his passenger, Henderson, was awake now.

"Must be getting close, eh? Has Center turned you over to Approach yet?" he asked.

"Just coming up now," the pilot replied. He tapped the screen which indicated the handoff to Approach Control. "Doesn't take 'em long because Lake Elmo Approach is co-located with the Center."

"You don't say? You mean they don't have radar in that tower up ahead?"

"They have radarscopes, but the radar returns are received by the Center system and fed into the tower scopes, as needed, by remote transmitter and landlines. Some towers still have Approach Control in the building but many approach controls are now co-located with Centers. The tower controllers mostly just handle landing and takeoff sequencing. The new system saves a lot of time and talk."

As they spoke the transponder screen in the cockpit became active, displaying terminal weather and headings and altitudes for the approach. Since entire messages were displayed instantaneously, pilot comprehension was also very quick, although the message remained on the screen until the ACKNOW button was hit. At one point the pilot wanted to review a vector clearance, which he accomplished by means of the RECALL button.

As he passed over his final approach fix the screen displayed the frequency for contacting the tower at Lake Elmo. The C-610 was cleared to land on runway 13.

Later at the ramp, as the pilot walked off with his passengers, ex-pilot Henderson remarked that it had been a "slick flight. Kinda dull, really, but slick. Something's gone out of flying, don't you think?"

"Right," his pilot agreed, "the uncertainty." ■

Weather briefings adequate for all types of flying will be accessible to pilots at home if they have a computer terminal.

Maximum Loads vs Minimum Strips

Calculating the safe takeoff load for aerial application

It is not surprising that while most general aviation accidents occur on landings, in ag flying takeoff accidents are far more numerous. Information taken from FAA's data bank shows 356 ag accidents in the first three quarters of 1981 (January 1 through October 16), of which 105 were takeoff accidents. There were three fatalities, 18 aircraft destroyed, and 87 aircraft substantially damaged.

The reasons behind this susceptibility to takeoff accidents are obvious. Agricultural aircraft commonly take off with a full load, operating from makeshift airstrips under varying conditions. At times the field may be soggy from spring thaws or fall rains; at other times it may be rock hard from summer drought. Temperatures may range from pre-dawn frosts to record-breaking heat spells in the afternoon. Windshifts may lead to takeoffs in the direction of obstacles, such as trees or fences, or even upslope. An appreciation of existing slope, when operating out of any convenient open field, is not easy. Ag flying is one of the most demanding forms of aviation, and one for which little relief has been provided by the advanced and sophisticated instruments which has made flying in general safer and more precise. The ag pilot, more than any other type of flyer, depends on his physical senses, mental alertness, and seasoned judgement to make the right decision—even when it has to be a split-second decision.

Most of the environmental factors affecting ag flying are outside the pilot's control. He *has* to use makeshift airstrips, including farm fields, for an efficient operation. He has to fly at all hours during the busy season including many hours of pre-dawn flying in some areas from unlighted strips. He has to disperse certain time-limited materials within the allowable period—sometimes a matter of hours. The one important factor he does have charge of is his payload. *Overloading for the prevailing conditions is the most common cause of ag takeoff accidents. And it is usually preventable.*

A reduction in the payload always has a direct positive influence on takeoff performance. Unfortunately, reducing the payload also has a negative affect on the profitability of aerial application work. Ag aircraft have been observed to stagger into the air with such marginally flyable payloads that they had to be bumped hard to become airborne. Full hoppers get the job done faster, but unsuccessful takeoffs can also age a plane—or a pilot—very fast. Replacement costs for wrecked aircraft in 1981 totaled over $12 million.

In many takeoff accidents the aircraft is pretty badly damaged but the pilot emerges in good condition—often thoroughly puzzled by his failure to get his plane into the air safely. Consider, for example, a trio of accidents involving the application of dry material to grain fields.

In late June a pilot was fertilizing rice near Sacramento, CA with sulfate, flying an *AG Cat*. He had started the operation at 5:00 a.m. from the 2,000' north/south dirt strip, departing to the north. On his sixth takeoff, at 2:30 p.m., with the temperature near 100° and a very light southerly wind, he was surprised to find he was unable to clear a rice check (or levee) at the end of the runway. The landing gear impacted with the ground, flipping the *AG Cat* over and demolishing it. The pilot was fortunate to escape serious injury.

On this last run the aircraft was carrying 1,800 lbs. of sulfate and 30 gallons of fuel. Operating information provided by the manufacturer for the Grumman C-164A did not include such data as runway required and climb performance for specific weight and temperature. The airplane had been flight-tested for a maximum hopper weight of 2,000 lbs. and was operating within those flight test parameters at the time of the accident. Apparently the combination of high temperature (the density altitude was 3,000', compared with the field altitude of 20'), and the slight tailwind which the pilot reported experiencing just prior to liftoff downgraded the airplane's climb performance to near-zero.

Another rice dusting accident took place at Richvale, CA about 100 miles north of Sacramento on a summer afternoon in 1980. Again the pilot took off downwind, although he stated later to investigators representing the National Transportation Safety Board that he was not aware of any wind at the time. However, the Safety Board established that a wind of approximately 20 knots blowing from the south, with light turbulence, was recorded in the area one hour and 20 minutes after the mishap.

The aircraft, a *Naval Aircraft Factory N3N-3* (open-seater biplane similar to a *Stearman*), was loaded with 2,100 lbs. of herbicide dust and 30 gallons of fuel. The pilot, attempting to take off to the north on the 2,600' paved runway, did not achieve liftoff until he encountered rising ground at the end of the runway. While trying to remain airborne he stalled and crashed

Drift of highly concentrated spray materials must be contained closely within fields being treated, limiting application hours to calm wind periods of the day. Time-limit for dispensing some pesticides also contributes to pressure on pilot to carry maximum loads.

approximately 500 feet beyond the airport. The airplane was damaged beyond repair, but the pilot was not seriously injured. He was lucky. Even in a no-wind condition, the extended takeoff roll should have warned him he was overloaded.

Less fortunate was the owner and operator of a Piper *Pawnee* which crashed and burned at Tupelo, AR during a rice fertilizing flight. The pilot, known as a cautious and conscientious airman, had been at work since dawn on this June day in central Arkansas, spraying some 270 acres during the morning. At noon he removed the spray rig and installed a dry material dispersal system. He completed three flights dispersing dry fertilizer without incident, operating from a 2,100′ north/south grass strip.

At the time of his fourth dusting flight, 1:40 p.m., the local temperature was in the 90°F range. The gross weight on takeoff is not known. After leaving the runway the pilot entered a left turn, apparently to avoid flying at low altitude over a group of houses at the edge of town, as was his custom. As he flew over a road just before the houses, his tailwheel caught a power line, causing the airplane to impact a tree at a height of 40′ above the ground, and then crash into a house nearby. The pilot died in the ensuing fire, which also destroyed the aircraft and the building.

Because of the fire and the fatality, it was not possible to pinpoint the cause of this accident, which was nevertheless ascribed by the Safety Board to the pilot's error in taking off under conditions that prevented him from achieving a safe maneuvering speed.

It is significant that all three of these accidents took place in the early afternoon in early or midsummer, when air temperatures were near a peak, and the day's work nearly done.

How can a pilot calculate the maximum spray or dusting load he can carry safely? The flight manual or placards will tell him the maximum certificated takeoff gross weight for the aircraft under standard conditions, but "field approval" may have been granted for heavier gross weights. Furthermore, except for some recently certificated aircraft, no performance information has been developed for all possible environmental conditions which significantly affect ag aircraft takeoffs. These factors include altitude (primarily pressure altitude corrected for ambient temperature), wind speed and direction, runway length and condition, and runway slope angle if present.

Density altitude is a prime reason why aircraft that manage to lift off with a full load are unable to climb out of ground effect, or to maneuver away from obstacles.

Granted, ag pilots have little time to spare between flights, but it takes only a few moments for a periodic check of the air temperature and the pressure altitude (the latter can be indicated on the aircraft altimeter by cranking in 29.92 inches of mercury as the barometric pressure). The brief time needed to calculate density altitude, on any of the handy calculators, could save a plane—and perhaps a life.

Wind and runway conditions primarily affect the speed achieved during the takeoff—and the distance to liftoff. Wind force is not easy to estimate accurately in field conditions, but most ag flyers soon become pretty adept at it. On hot days it is a good idea to personally check the wind at both ends of the takeoff strip, unless the area is well flagged. Runway conditions, including slope, are more likely to be deceptive, especially when located on open fields overgrown with grass or stubble. Taking measurements with the airplane altimeter is the only certain way of avoiding unpleasant surprises based on guesswork or local legend. The percent of the grade may be easily calculated when the strip length and altitude differential is known; or it may be indicated (Fig. I).

If any of the major factors are negative (above-standard density altitude, tailwind, short or wet field, upslope grade, etc.), safety may require a reduction in payload or an increase in takeoff roll distance, or both. The question is, *how much*?

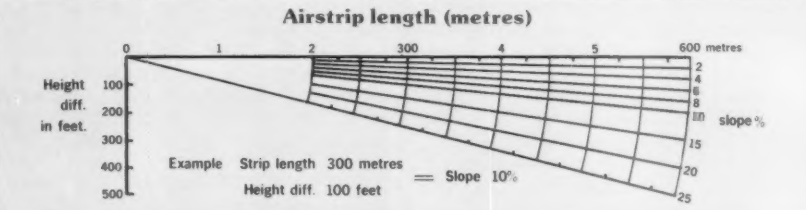
Many experienced ag pilots go strictly by "feel." They start the day's work with a load they know they can handle and gradually work up to what feels like a safe maximum. Problems may occur late in the day if the temperature mounts or the wind shifts and the pilot does not adjust his load for the changed conditions.

For ag aircraft where manufacturers do supply performance specifications, utilizing the associated graphs may take more time and effort than some ag pilots are able to give. Furthermore, some important factors, such as tailwind effect, or upslope, may not have been considered.

Figure II is a series of calculations for Fletcher FU-24-950/954 in varying conditions (The Fletcher is a low-wing, enclosed cockpit ag plant built in California but used predominantly in New Zealand and Australia). Situation 1 shows the takeoff distance required for a full payload (2,117 lb.) in a calm wind at standard temperature and pressure, and level terrain. Note that with a modest increase in altitude and temperature (Situation 2), resulting in a density altitude of 2,000′, the payload would have to *decrease* by some 350 lbs. Theoretically the plane could takeoff at maximum gross weight with 2,000′ density atltitude by means of an *extended takeoff* run (1,640′), if that were available (Situation 3). However, in these conditions, climbout would be extremely slow. The aircraft would have to travel 2,165′ from start of roll before it could clear a 20′ terrain obstacle

Figure I. Airstrip Slope Calculator

1 Note Altimeter reading at desired lift-off point
2 Note Altimeter reading on loading area
3 Enter graph with height difference
4 Move across to strip length curve.
5 Follow gradient line and read off slope.



Pilot personally inspecting the hopper load on his air tractor *near Salinas, CA.*

Figure II. Performance Data for Fletcher FU-2Y 950/954

Sit.	Takeoff Roll	Wind	Pressure Altitude	Temp.	Runway Slope	Obstacles at End of Runway	Maximum Payload
1	1,380′	calm	sea level	59°F	level	—	2,117 lb.
2	1,380′	calm	1,000′	70°F	level	—	1,763 lb.
3	1,640′	calm	1,000′	70°F	level	—	2,117 lb.
4	2,165′	calm	1,000′	70°F	level	20′	2,117 lb.
5	2,657′	calm	1,000′	70°F	2% up	20′	2,117 lb.
6	1,380′	5K (tail)	sea level	59°F	level	—	1,542 lb.
7	1,770′	5K (tail)	sea level	59°F	level	—	2,117 lb.
8	1,280′	5K (head)	seal level	59°F	level	—	2,117 lb.

(Situation 4). And if the runway had as much as two percent of upslope, the fully loaded Fletcher would require a good half mile in order to clear that 20′ obstacle (Situation 5).

Even with sea level density altitude and a level runway, if the pilot is obliged to take off *downwind*, with as little as a 5K tailwind, he will have to tighten his load by 575 lbs. (Situation 6), or extend his takeoff run to 1,770′ (Situation 7).

A 5K headwind, on the other hand, would shorten the required takeoff roll by approximately 100′, given a maximum payload and no unfavorable factors (Situation 8).

The performance chart used for these calculations is not theoretical nor does it have general applications to ag aircraft. It was developed by the New Zealand Civil Aviation Division, Ministry of Transport, on the basis of carefully controlled test flights, with one particular make and model of aircraft, in top condition, using a firmly packed turf strip. In actual flight the presence of any mechanical insufficiencies, or the absence of pilot skill would significantly reduce these performance expectations.

The data suggests that for an aircraft of similar performance, operating in conditions of fairly constant barometric pressure, a very rough rule of thumb would decree that for every 10°F increase in temperature it would be desirable to reduce the load by 100 lb. or increase the takeoff roll by 100′, and for every 5 knots of tailwind 500 lb. should be offloaded, or 500 feet added to the takeoff roll.

There are also, of course, some intangible factors affecting every flight which can never be measured or fully understood. Every pilot has his good days and his bad days, and his performance may vary accordingly. And every aircraft is also an individual; once in a while you encounter one that is a "mule" to get off the ground, for no good reason. These differences can be serious, when your margin for error is razor thin.

A case in point is an accident which occurred near Spokane, WA in March when two Cessna 188 *Ag Trucks* were treating wheat fields with dry fertilizer. The two aircraft, both 1975 vintage, were identical in nearly every aspect, except that the lead plane was flown by a more experienced pilot.

According to the National Transportation Safety Board report, takeoff was from a paved country road leading to an abandoned missile base. A section of the road ran in a straight line from east to west for about 3,000′. Because supplies for dusting were loaded at the western end of the makeshift runway, the two pilots planned to takeoff to the east rather than taxi the full length of the road. Their takeoff would be favored by a downslope of approximately 2°. On the other hand they would have to cope with a quartering tailwind of 10 to 15K, and a string of telegraph lines located about 25 feet above the departure end.

The two pilots flew into the landing site that morning and discussed the application job with the farmer. They measured the available runway by driving along it in the farmer's car. The lead pilot calculated that with a 1,000 lb. load he could get off the ground within 1,800′, and that at the 2,500′ point he could clear a 50′ obstacle. He took off without difficulty and started a 180° turn well before reaching the telegraph lines. He then observed his partner begin his takeoff roll in the second 188. He commented later:

"When the plane was still on the ground past the point where I had taken off I began to have doubts as to the outcome. The plane started to fly, but was closing in fast on the telegraph lines. Just before the plane struck the pole and lines I could see that it was close to stall altitude. When it hit the pole the right wing snapped over the top and it fell nose down. Almost immediately I saw smoke."

The witness added that by the time he landed and rushed to the crash site, the airplane was blazing. However, the occupant had managed to extricate himself and crawl to safety, despite two broken knee caps.

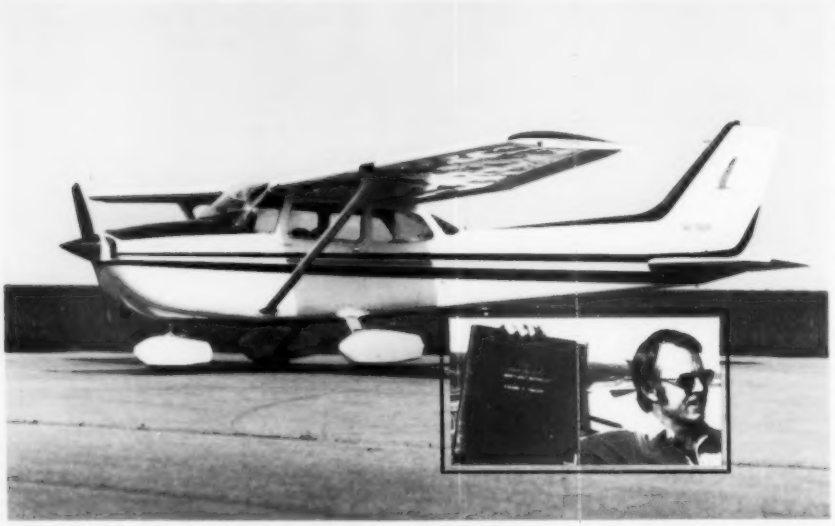
The Safety Board, in their investigation, found no evidence of mechanical failure prior to the accident. Surprisingly the second plane had carried a lighter load—by about 250 lb.—than the lead plane which had accomplished a normal takeoff. *What made the difference?*

Possibly insufficient experience, plus worrisome concern about the obstacle ahead. Possibly a freakish wind shift, or an undetected mechanical failure, such as carburetor icing. Probably no one will ever know the exact cause of this accident. But it highlights the point that no two aircraft and no two pilots are going to perform exactly alike. *Never try to carry more than you personally are sure you and your aircraft can handle.*

You are not competing with other pilots as much as with Mother Nature, who can always find something new or unexpected in her bag of tricks. ■

Editor's Note: Graphic material provided courtesy of the New Zealand Civil Aviation Division, Ministry of Transport and may not be reproduced without their permission.

Makeshift runways, such as farm roads, have their ups and downs.



IMPOSSIBLE DREAM. Frank Hardy (inset) had always wanted his own airplane but could never afford it. A dream came true for him when GAMA presented him with the keys to a new Cessna *Skyhawk*.

EL PASO PILOT WINNER OF SWEEPSTAKES AIRPLANE

A 41-year old hospital electrician was the Grand Prize Winner of the FAA/GAMA Safe Pilot '81 $50,000 airplane sweepstakes. Frank Hardy, a commercial and instrument rated pilot from El Paso, TX, first learned to fly in 1962 and has logged 1,200 accident-free hours. A regular attendee of FAA pilot safety seminars, Hardy never expected to beat the odds and be selected from nearly half a million people who attended 9,000 FAA meetings last year.

Hardy was "shocked" to learn he had won a $50,000 airplane of his choice and thought it was "a lot of baloney" until GAMA officials presented him with an airplane catalogue to select from. Holder of the Phase I and II pilot proficiency wings, Hardy attends up to 15 safety seminars a year in the El Paso area and believes they have helped him maintain his perfect safety record.

"Everybody should go," he says, "because in flying you always forget a little of what you learned and you need to review." Learn from the mistakes of others is his philosophy, and he attends the seminars to find out what causes others' accidents so he will not repeat their mistakes. Hardy selected a Cessna 172 to be used as a pleasure and business aircraft.

Safe Pilot '82 will again offer an airplane sweepstakes for attendees of safety seminars this year, with the grand prize now a $60,000 airplane.

MORE IFR DEPARTURES ALLOWED

Under the recently expanded tower/en route control program, 10 of the nation's busiest major airports will be able to handle additional IFR departures, so that small communities will regain air service they may have lost when operations were reduced after the August 1981 controller strike.

Tower/en route control enables piston or turbo-prop aircraft flying IFR at altitudes less than 10,000 MSL to carry out their flights entirely under control of terminal radar facilities. These tower-to-tower flights do not enter en route traffic control center airspace, where pilot and controller workload has reached peak capacity.

Under the new routes added to the system, airports at Atlanta, Boston, Chicago, Cleveland, Denver, Detroit, New York (JFK), Los Angeles, Miami, and San Francisco will offer up to 300 additional IFR departures per day to or from small communities that may have been dropped from the pre-August schedule.

Pictures and descriptions of the expanded tower-to-tower program are published in the Airport/Facility Directory or are available from local Flight Service Stations.

HARNESS DEADLINE ADJUSTED

Operators of large and turbine-powered multi-engine airplanes now have as much as an additional year to meet the deadline for installing a combined shoulder harness/seat belt at each flightcrew and flight attendant seat (Part 91.200).

Supply and equipment shortages have made some operators unable to meet the March 6, 1982 deadline. To prevent loss of revenue that would result from grounding aircraft not in compliance, FAA has amended 91.200(b) by emergency rule to permit an extension to March 6, 1983.

For information on how to apply for extension, contact FAA, Project Development Branch, AFO-850, 800 Independence Ave., S.W., Washington, DC, 20591; 202-426-8150.

PETITION FOR "RECREATIONAL" PILOT CERTIFICATE CONSIDERED

A new type of pilot's certificate and a change in the recent flight experience requirements for private pilots are discussed in a petition for rule making now under consideration.

The petition would establish a "recreational pilot's certificate" for persons wanting to do their flying in relatively simple aircraft in non-commercial use under limited conditions of operation. Certain flight experience requirements, such as crosscountry time and ATC operations, would be lessened or eliminated for certificate applicants, and some new limitations would be imposed. In lieu of minimum flight time a specific number of flights would be mandatory. No medical certificate would be required, but the applicant would have to certify that he has no medical defects that would prevent safe operation of an aircraft.

A recreational pilot would have to be 16 years old (14 for a student). He would be restricted to a one- or two-seater, single-engine (not more than 200 hp) airplane. An expense-sharing passenger could be carried, but flying for compensation or hire would be prohibited. Business flights would likewise not be permitted. Also prohibited would be night flights, international flights, operations at tower airports, operations above 10,000' MSL or 2,000' AGL (whichever is higher) and flights when visibility is less than three statute miles.

An *annual* rather than biennial flight review would be required until 400 hours of flight time were exceeded; then, a biennial review would be applicable.

If the petition is adopted, the annual flight review would also be extended to private pilots with less than 400 hours with the biennial review replacing it after 400 hours are passed.

Copies of the proposed rule may be obtained from FAA Public Affairs, APA-430, 800 Independence Ave., S.W., Washington, DC, 20591. Comments on the petition (PR 82-3) should be sent no later than June 15, 1982 to the General Counsel, AGC-240, Docket No. 22692, same street address.

THEFTS DOWN, VALUE UP

The number of aircraft stolen in 1981 decreased from 241 to 214, but the value of the purloined planes increased by nearly $5 million as thieves set their sights on more expensive aircraft, among them several general aviation business jets. However, the decrease in theft may be due in part to "immobilizers" for aircraft now available similar to wheel locks on cars. Popular among plane thieves (usually drug smugglers) are large single-engine and medium twin aircraft with high useful loads.

Avionics thefts, which have increased nearly 100% since 1978, are continuing to rise; also incidents of siphoning avgas from parked aircraft. Victims should contact the local FSS, as well as police, so that an alert can be issued nationwide. For information on the aircraft immobilizer, contact the Aircraft Owners and Pilots Association, Product Sales and Services Department, P.O. Box 5800, Washington, DC, 20814; 301-951-3948.

• Helicopter CFII Test Guide?

To your knowledge is there a written test guide for the Instructor-Instrument Helicopter rating?

Shawn Knickerbocker
Ft. Bragg, NC

The FAA does not yet publish a written test guide for this rating. Material covered on the test would be found in the following advisory circulars:

1. *61-13B, Basic Helicopter Handbook ($2.75)*
2. *60-14, Aviation Instructors Handbook ($3.00)*
3. *61-27C, Instrument Flying Handbook ($7.50)*
4. *61-58A, Flight Instructor Practical Test Guide, ($1.50)*

All of the above publications are available from the Superintendent of Documents, Government Printing Office, Washington, DC, 20402. Send check or money order.

• AIM on Airport Advisory Areas

While studying for an airman written test, I found what seems to be a discrepancy in the Airman's Information Manual concerning the Airport Advisory Area. In the glossary the Area is defined as being "within 10 miles" of an airport without an operating control tower but with an FSS. However, Paragraph 131 in the body of the publication states that it is within *five* miles. Which should I use if that question comes up on my test?

Name withheld
Arlington, VA

An Airport Advisory Area is the area within **10 statute miles** of an airport without an operating control tower but with an FSS. A correction will appear in the May 13, 1982 issue of AIM, and test evaluators in Oklahoma City will be advised of the corrections as well.

• Operating not Navigating

In the January/February 1982 "Instrument Corner" you indicate that an instrument rated and current pilot can log instrument time if he *navigates* solely by reference to instruments. Not so, I say. "Navigating" is not the same as "operating." What do you say?

Katy Boyd
Dublin, OH

We say you are right. We inferred that the pilot meant "operate" when he said "navigate," but that does not coincide with the regulation. FAR 61.51(c)(4) states that the pilot may log as instrument flight time only that time during which he operates *the aircraft solely by reference to instruments.*

• Bring on the Films!

Your publication has for many years promoted aviation safety very successfully. The FAA's 16mm sound motion pictures also promoted safety very effectively, and for many years I showed these excellent films at our monthly aero club meetings. In recent years since your film distribution has been handled commercially, I have had problems—I couldn't get the film I wanted or even the second choice; or they arrived too late. For a while I tried borrowing films from the Air Force but they were old and outdated.

As Safety Officer of the club, I cannot easily conduct a safety program without some new films that are well-maintained and easy to obtain. Our members fly mostly VFR in single-engine, fixed-gear aircraft. They need continuing safety lessons in the basic areas such as takeoffs and landings, avoiding bad weather, and in-flight emergencies. I would like to know what is new in FAA audio-visual media, plus who-where-when-and-how to obtain the programs.

Jon Sank
Haddonfield, NJ

In April last year, a moratorium went into effect on the production and procurement of all federally-produced audio-visuals. As of this writing, the moratorium has not been lifted. Until it is there are no plans to make new FAA safety films. For budgetary reasons FAA has temporarily suspended its free-loan distribution of existing films. However, most FAA safety films and other audio-visual slide-tape shows, made under FAA direction by organizations such as GAMA, are readily available from your local accident prevention specialist. You may also write or call Willard L. Pedersen, Chief, Accident Prevention Staff, AFO-806, 800 Independence Ave., S.W., Washington, DC, 20591; 202-426-8102.

• From Sea to Land

Question: An airman received his commercial pilot's certificate in a single-engine seaplane. Now he wants to add an airplane single-engine land rating to that commercial certificate, and this calls for a check ride in a complex aircraft (controllable prop, flaps, and retractable gear). Must he take the check ride in a retractable gear airplane or does the fact that he met the complex portion in a seaplane suffice?

Donald C. Paul
Veradale, VA

Under FAR 61.43 (Flight Tests), the applicant must be prepared to perform each of the required pilot operations listed in Part 61.127(a), Commercial Pilot Flight Proficiency. Therefore, the airplane furnished for the flight test must have retractable landing gear, flaps, and controllable propeller. Also, under Part 61.63(c)(2), the applicant must pass a flight test appropriate to the certificate and "applicable to the aircraft category and class rating sought." This does not allow any pilot operation required for the flight test to be ignored.

FAA GENERAL AVIATION NEWS welcomes comments from our readers. No anonymous letters will be used, but names will be withheld on request. Address: FAA GENERAL AVIATION NEWS, AFO-807, Washington, D.C. 20591.

• Special VFR and Closed Towers

Since the reduction of control tower operations, more control zones are without weather reporting. Preflight preparation requires the pilot to know the suitability for VFR flight without official observations. My question is:

When there is no official weather reporting, can a pilot operate special VFR in a control zone?

Chester J. Hoffman
Chahokia, IL

The pilot of an aircraft may operate under Special VFR in a control zone if he complies with the following: (1) has received an appropriate ATC clearance (If the tower is closed clearance may be obtained from an FSS, an approach control, or ARTCC having jurisdiction.); (2) operates clear of clouds; (3) has at least one statute mile flight visibility; and (4) has, during takeoff and landing at any airport within the control zone, ground visibility of at least one statute mile. If ground visibility is not reported—which would be the case if there is no official weather observer because of a closed tower—then flight visibility of at least one statute mile must be present for takeoff or landing.

For further explanation of control zones and tower closings, see the January/February 1982 issue of FAA General Aviation News.

INSTRUMENT CORNER

• No Final Approach Fix?

I have been receiving your informative publication for many years and now I have a question that needs answering.

At a recent Flight Instructor Revalidation Clinic, we were discussing precision and non-precision approaches. I mentioned that a precision approach has no final approach fix (FAF), and that the FAF only refers to a non-precision approach. That brought up the question, why does the symbol for FAF (a maltese cross) appear on the approach plate for **both** precision and non-precision approaches? I replied that it was just in case the glide slope portion of the precision approach (ILS) becomes inoperative—then the approach becomes non-precision and you need the FAF.

Could you please confirm this for us?

Wallace Balla
Greenwich, CT

The maltese cross on the planform view of an ILS approach chart indicates that this procedure can be used for a localizer (LOC) approach. In this event, the cross is in the FAF for the non-precision approach.

U.S. GOVERNMENT PRINTING OFFICE
SUPERINTENDENT OF DOCUMENTS
WASHINGTON, D.C. 20402

OFFICIAL BUSINESS

Postage and Fees Paid
Federal Aviation Administration
Third class bulk
DOT 515

FAN SERIA300SAISSDUE006R 1
SERIALS PROCESSING
UNIVERSITY MICROFILMS INTL
300 N ZEEB RD
ANN ARBOR MI 48106

Ag planes shirk uphill work

Check the slope before you cope